

AMIETE – CS/IT {NEW SCHEME}

Time: 3 Hours

JUNE 2015

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

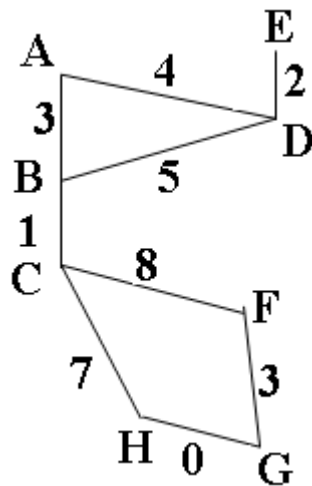
- a. The _____ is a technique for direct search.
- (A) Binary Search (B) Linear Search
(C) Tree Search (D) Hashing
- b. The smallest element of an array's index is called its
- (A) Lower bound (B) Upper bound
(C) Range (D) Extraction
- c. One can convert a binary tree into its mirror image by traversing it in
- (A) Inorder (B) Preorder
(C) Postorder (D) Any order
- d. The complete binary tree at k-depth has _____ leaf nodes.
- (A) 2^k (B) $2^{k-1}-1$
(C) $2^{k+1}+1$ (D) 2^{k+1}
- e. Data structure representation in memory is known as _____.
- (A) Recursive (B) Abstract data type
(C) Storage structure (D) File structure
- f. Which of the following technique is appropriate for the Merge sort?
- (A) Divide and conquer strategy (B) Heuristic search
(C) Backtracking approach (D) Greedy approach

- g. The postfix form of the $A+B*C$ is
- (A) $ABC+*$ (B) $ABC*+$
(C) $AB+C*$ (D) $AB*C+$
- h. Which of the following operation is performed more efficiently by doubly linked list as compared to singly linked list is?
- (A) Inverting a node after the node with given location
(B) Searching of an unsorted list for a given item
(C) Deleting a node whose location is given
(D) Traversing a list to process each node
- i. The result of the following operation
Top (Push (S, X)) is:
- (A) X (B) Null
(C) S (D) None of these
- j. If an algorithm is composite of two independent time complexities $f(n)$ and $g(n)$. Then the complexities of the algorithm is in the order of
- (A) $f(n) \times g(n)$ (B) $\text{Max}(f(n), g(n))$
(C) $\text{Min}(f(n), g(n))$ (D) $f(n) + g(n)$

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

- Q.2** a. What is meant by an Abstract data type (ADT)? Explain generic ADT and how it is different from ADT. (4+4)
- b. What do you understand by the complexity of an algorithm? Explain relation between the time and space complexities of an algorithm. (4+4)
- Q.3** a. Describe the stack data structure. Also mention the limitations of using array for Stack implementation. (6)
- b. Using an appropriate example, explain the use of stack in Recursion. (4)
- c. Describe the Queue representation and implementation using suitable examples. (6)
- Q.4** a. Write down a function to merge two linked lists containing same type of information in ascending order into a sorted single linked list. (6)
- b. Write a C program to perform the creation of circular linked list. (4)
- c. Assume the linked list in the memory consisting of numerical values. Give a Program segment for the following:
- (i) Find the maximum "MAX" of the values in the Linked list.
(ii) Find the average "MEAN" of the values in the Linked list. (6)

- Q.5** a. What is threaded binary tree? How does Threaded binary tree represented in Data Structure? (3+4)
- b. Define Binary Search Tree (BST) with its essential properties. Generate a Binary Search Tree for the given series of numbers
46, 37, 80, 22, 92, 122, 102, 40, 41, 60, 70, 50 (4+5)
- Q.6** a. What do you mean by Minimum Spanning Tree (MST) of a graph? Write the Kruskal's algorithm and apply it on the following graph to find the MST: (10)



- b. Discuss the different graph traversal techniques in detail. Also list their advantages & disadvantages. (6)
- Q.7** a. Describe Hashing and Hash function. What are problems in hashing? (4+2)
- b. Explain the different collision resolution techniques. (4)
- c. Write an algorithm for binary search. List out the conditions under which linear search of a list is preferred over binary search. (4+2)
- Q.8** a. Consider a list which is already sorted, which sorting algorithm is performed best and why? Also State that algorithm. (4)
- b. Explain Heap Sort algorithm. Sort the following sequence of numbers using heap sort algorithm:
20, 12, 25 6, 10, 15, 13 (6+6)
- Q.9** a. Explain Direct File organization. State advantages and disadvantages of this file organization. (2+6)
- b. Give a Program code in C that copies the contents of one file into another file using command line arguments. (8)